

MA 261

Quiz 9

21 Οκτώβριος 2016

Instructions: Show all work, with clear logical steps. No work or hard-to-follow work will lose points.

Problem 1. (4 points) Solve for x .

$$e^{2x} - 3e^x - 7 = 0.$$

Solution. I don't write the exams, but this would be an excellent exam question. This kind of stuff shows up in calculus all the time, so we should be comfortable recognizing that this is a quadratic equation in e^x . Remember, $e^{2x} = (e^x)^2$. So let's make the substitution $u = e^x$. Then this equation becomes

$$u^2 - 3u - 7 = 0.$$

You'll quickly notice that this doesn't factor, but we can find the roots using the quadratic formula.

$$u = \frac{3 \pm \sqrt{3^2 - 4(-7)}}{2} = \frac{3 \pm \sqrt{37}}{2}.$$

Since $\sqrt{37} \approx 6.08276 > 3$, we know that $3 - \sqrt{37} < 0$ and $3 + \sqrt{37} > 0$. We have found solutions for u , but remember $u = e^x$. So set

$$e^x = \frac{3 - \sqrt{37}}{2} \text{ and} \tag{1}$$

$$e^x = \frac{3 + \sqrt{37}}{2} \tag{2}$$

But since (1) is negative, $\ln(\frac{3-\sqrt{37}}{2})$ is undefined. So our only solution is

$$x = \ln \left(\frac{3 + \sqrt{37}}{2} \right).$$

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Problem 2. (0 points) Are you counting down the days until Thanksgiving break? How many?

Solution. Including 10/24, there are 12 lectures of MA 158 before Thanksgiving break! ☺